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EXIT AND STRATEGIC BEHAVIOR UNDER INFORMATION AND INCENTIVE PROBLEMS IN FINANCIAL MARKETS

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Abstract *(113 words)*

Prior research has documented the impact of firm and industry specific variables in shaping the post-entry exit probability. These studies have found a mixed effect of competition, usually proxied by concentration, upon exit. This paper uses the empirical measure developed by Sundaram, John and John (1996), which captures the theoretical notion of competition in strategic complements versus strategic substitutes. Our results show that the survival of newly established firms is lower when competition is in strategic complements and higher when competition is in strategic substitutes. Furthermore, the evidence suggests predation since the effect of competition depends upon the firm's financial structure and upon the extent of information and incentive problems in financial markets.

JEL: D43, L11, L13, L40, G32.

I. INTRODUCTION

The impact of firm and industry specific variables in shaping the post-entry exit probability has been documented in numerous studies. These studies typically find a negative relation between firm start-up size and exit, a result that Troske (1989), Geroski (1995) and others have interpreted as being consistent with the learning models from the entrepreneurship and IO literatures. These studies further show that diversifying entrants and firms starting with a larger number of plants are more likely to survive (e.g., Mata and Portugal (1994), Audretsch and Mahmood (1995)). Next, the evidence indicates that scale economies and industry turbulence decrease the survival chances of entrants whereas sunk costs and industry growth reduce the likelihood of post-entry exit (e.g., Audretsch (1995)). Finally, post-entry survival also depends upon the technological and knowledge conditions in the industry, as shown in Acs and Audretsch (1993), among others.

Whereas the direction of the impact of the above firm and industry level variables is consistent across the different studies, this consistency is not found for the impact of competition within the industry.[1] A potential explanation for this lack of uniformity may be the way in which the competitive effect has been operationalized. Most studies use a measure of industry concentration to proxy for the nature of competition: the CR4 or CR8 concentration ratio, which takes the market share of the largest four, respectively eight, firms into account (used in Acs and Audretsch (1993), among others) and the Herfindahl-Hirschman concentration index, which considers the market shares of all firms in the industry (used in Mata and Portugal (1994), Wagner (1994), among others). The underlying idea is that collusion, which alleviates competition among incumbent firms, can be achieved and sustained more easily in highly concentrated industries (e.g., Chamberlin (1933), Bain (1956), Stigler (1968)). The impact of

industry collusion upon post-entry survival, however, is not a priori clear. On the one hand, collusion may increase the survival chances of entrants when the cartel cuts back its own output in response to entry, as the OPEC did during the seventies. Conversely, the likelihood of retaliatory conduct against entrants may be greater in a cartel, which is then expected to lower post-entry survival, as argued in Wagner (1994). Furthermore, theoretical arguments in Tirole (1988), Martin (1988) and others point out that whereas firms in highly concentrated markets are likely to *recognize* their mutual dependence, they may be unlikely to *achieve* – tacit or overt – collusion unless they produce a standardized product, have the same costs and share a common discount rate (i.e. have the same time preference). In other words, concentration is a necessary, but not sufficient condition for collusion and differences create disagreements. Empirical evidence exists refuting the conjectured systematic positive relation between industry concentration and collusion (e.g., Rosen (1982), Slovin, Sushka and Hudson (1991), Sundaram, John and John (1996)).

From the above discussion, it is clear that traditional concentration measures mask the separate influences of competition in strategic complements versus strategic substitutes.[2] In response to these pitfalls, Sundaram, John and John (1996) created another measure of competition, the Competitive Strategy Measure (CSM), which captures the theoretical notion of strategic complements versus substitutes. We apply this measure to investigate the impact of competition upon exit for a sample of 235 true business start-ups from the Belgian manufacturing industry. We find no competitive effect using the traditional CR4 concentration ratio. On the other hand, the CSM indicates that the likelihood of exit increases with

[1] Doi (1999), for instance, finds that industry concentration is significantly negatively related to exit, whereas Kovenock and Phillips (1997) find that following their recapitalization, firms in highly concentrated industries are significantly more likely to close plants and less likely to invest.

[2] Others use the concept of *conjectural variation* to classify different types of competition. Conjectural variation is defined as the percentage change in its rivals' output that a firm expects in response to a one per cent change in its own output (Martin (1988)). A positive value for the conjectural variation parameter corresponds to competition in strategic complements, whereas a negative value for this parameter corresponds to competition in strategic substitutes. Cournot (quantity setting) competition can generally be classified as competition in strategic

competition in strategic complements, but decreases with competition in strategic substitutes, ceteris paribus. We further refine our tests to demonstrate that the competitive effect depends upon the entrant's initial financial structure. In particular, the extent of industry competition has a stronger impact upon exit for entrants that are more highly levered at the time of start-up, ceteris paribus. Furthermore, this relation only holds when information and incentive problems in financial markets are extensive. An alternative interpretation of the significant interaction term between competition and financial structure, namely that leverage makes firms financially vulnerable in markets that are characterized by hard competition, is therefore rejected. Furthermore, our results are consistent with the theoretical models on financial market predation by Fudenberg and Tirole (1986), Bolton and Scharfstein (1990) and Maurer (1999). These authors argue that when information and incentive problems in financial markets are extensive, incumbent firms may have an incentive to predate such as to influence the perceptions of financiers on the start-up's quality and/or behavior.

Our paper not only extends the discussion on predation upon new entrants, but is also related to the growing literature on the interactions between product market competition and financial structure. Brander and Lewis (1986) show that due to limited liability, firms in an oligopolistic competitive setting may take on higher leverage in order to precommit themselves to a more aggressive output strategy. Brander and Lewis (1988) refine the above relation and find that it holds only when bankruptcy costs are fixed. Proportional bankruptcy costs, on the other hand, lead to a U-shaped relation between leverage and output. Glazer (1994) points out that the maturity structure of debt affects product market behavior; in particular, long-term debt may induce collusive behavior in the output market that would not be present if the firms had no debt or if their debt was short-term. Maksimovic (1988) extends the Brander and Lewis (1986) model to consider multiple periods of interaction between rival firms and shows that increases

substitutes, whereas Bertrand (price setting) competition can be considered as competition in strategic complements.

in debt make it more difficult for firms to maintain the collusive and, thus, restricted level of industry output.[3] An alternative view of the relation between output and financial markets is presented by Gertner, Gibbons and Scharfstein (1988), where the information that is revealed in financial markets may affect competition in the product market. Poitevin (1989) shows that the way in which information is revealed in the capital market, rather than the information itself, affects the extent of industry competition.

Our paper contributes to this literature by examining the interactions between financial structure and product market competition for the case of business start-ups, through their impact upon subsequent survival. Prior studies have examined large, listed firms with a diffuse ownership structure. In these firms, leverage may be used as a mechanism to more closely align the incentives of management with those of shareholders, as posited by Jensen (1986). Agency arguments, therefore, could also provoke a relation between firm financial structure and industry competition and the evidence reported in footnote 3 is consistent with such an interpretation as well. However, agency problems of equity are not present in start-ups since the management and ownership of these firms largely coincide. As a result, the relations that we find cannot be induced by agency considerations. In fact, we demonstrate that the interactions between financial structure and product market competition are driven by strategic behavior, as the above models predict.

[3] The limited empirical work on the relation between financial structure and product market competition largely rejects the predictions of the Brander and Lewis (1986) model. Chevalier (1995a), for instance, finds that following the announcement of a supermarket leveraged buyout, the market value of the recapitalized chain's rivals increases significantly. Also, she finds that de novo entry and expansion by existing supermarket chains become more likely when a large share of industry incumbents undertook an LBO. Chevalier interprets her findings as suggesting that increases in leverage lead to softer product market competition. Chevalier (1995b) finds that following a supermarket LBO, prices in local markets rise, but only when the LBO firm's rivals are also highly levered. On the other hand, when rival firms have low leverage and markets are highly concentrated, prices fall following the LBO, which suggests predation. Phillips (1995) examines four manufacturing industries subsequent to sharp increases in incumbents' leverage and finds that in three of them, industry output is negatively associated with the average industry debt ratio and that recapitalized firms either lose market share or fail to gain market share when smaller rivals exit the industry. Also, in their supply relationships, product price is positively associated with the debt ratio. In the divergent industry, rival firms have low leverage and entry barriers are relatively low (few scale economies, simple technology). Finally, Kovenock and Phillips (1997) find that following a sharp increase in leverage, firms in highly concentrated industries are more likely to close plants and are less likely to invest.

The remainder of the paper is organized as follows. In the next section, we discuss how strategic interactions in the output market can influence the survival chances of newly established firms and how these interactions can be measured by the CSM. In the third section, we describe our sample selection criteria, give some summary statistics on the sample firms and discuss our measurement of explanatory and control variables. Next, we present our empirical results. The last section concludes this paper and discusses the implications of our study for public policy.

II. STRATEGIC BEHAVIOR

Incumbent firms, through their strategic behavior, can influence the survival chances of newly established enterprises. In this section, we discuss cooperative and non-cooperative forms of strategic behavior. We argue that the nature of competitive interactions is better captured by the Sundaram, John and John (1996) CSM than by traditional concentration measures.

A. Cooperative versus non-cooperative strategic behavior

When output markets are imperfect, contracts are incomplete or information is only asymmetric or imperfect, strategic interactions in the product market can influence the outcome of firm investment and output decisions. As a result, the strategic behavior of industry incumbents can influence the exit risk of (newly established) rival firms. Carlton and Perloff (1994) define *strategic behavior* as the set of actions that a firm takes to influence the market environment so as to increase its profits. In their definition, this market environment consists of all factors that influence the market outcome (prices, quantities, profits, welfare), including the beliefs of customers and of rivals, the number of actual and potential rivals, and the costs or speed with which a rival can enter the industry (entry barriers). *Cooperative* strategic behavior

covers the actions that make it easier for incumbents to coordinate their efforts and to limit competitive responses. As a result, this type of behavior raises the profits of all firms in the market by reducing competition. *Non-cooperative* strategic behavior, on the other hand, consists of the actions of a firm that is trying to maximize its profits by improving its position relative to its rivals and, therefore, improves the profits of that firm while lowering the profits of competing firms.

In this paper, we are particularly interested in the strategies that firms can use to oust (new) rivals from the industry, i.e. non-cooperative strategic behavior, which includes predation. As discussed in Ordover and Willig (1981), Fisher (1990) and Bolton, Brodley and Riordan (1999), predatory strategies cover all actions that are profitable *only* because of the added market power the predator gains from eliminating, disciplining or otherwise inhibiting the competitive conduct of rivals or potential rivals. Predatory pricing, for instance, may result in short-term losses for the predator that can be recouped over time when rivals are driven out of the industry or potential entrants are scared off. Martin (1988) argues that two conditions must be fulfilled in order for a predatory strategy to be successful. First, the predator must be able to act before its rivals. Second, the predator must demonstrate that it will follow its strategy regardless of the actions of its rivals (commitment). Therefore, the predator must be able to survive short-term losses longer than can its rivals. This implies that among identical firms, predation cannot be a credible strategy and could even be classified as irrational behavior.

Even if differences exist between the predating firm and its rivals, these may not all lead to successful predation. Many early studies of predatory pricing, for instance, describe the predator as a large firm and its rival as a small firm and argue or simply assume that large firms can afford losses better than small firms during predatory periods (e.g., Benoît (1984)). This assumption has been refuted since it can be expected that investors will fund the small

efficient firm if it is not believable that the large firm will continue to incur losses forever (see also Fulghieri and Narayanan (1996)). Another argument that has been posited is that instead of financiers, customers may also support victims of predation. The reason is that customers are likely to have an interest in the preys' long-run survival as these firms reduce the market power of the predator (e.g., Easterbrook (1981)). Williamson (1977), however, points out that the transaction costs associated with negotiating long-term contingency contracts, which are necessary to curb free-rider problems among (potential) customers, are prohibitive. In addition, Bolton, Brodley and Riordan (1999) argue that counter-strategies that might foil predation rarely go through in a world of imperfect information.

Later models of predatory behavior argue that differences in firms' *beliefs* about their rivals rather than *actual* divergences can also result in successful predation (signaling theories of predation). In other words, perceived rather than genuine differences between the predator and its rivals may exclude or discipline firms. Then, one firm (predator) tries to convince its rivals that it would be unprofitable to remain in the industry by influencing their beliefs about expected future revenues or costs. This can be done through manipulating information on industry demand or the predator's costs (e.g., Milgrom and Roberts (1982)). Such information can subsequently change the preys' beliefs about how aggressively the predator will behave in the future. In the case of newly established firms, entrants have no prior (pricing) history whereas incumbents have such a record, resulting in a natural asymmetry between the firms. Then, incumbents may have a natural advantage over entrants, making predation a plausible strategy (e.g., test market predation and signal jamming).

In markets with asymmetric information between firms and investors, successful predation may also result from influencing the beliefs of financiers (financial market predation) rather than those of the firms themselves, as shown in Fudenberg and Tirole (1986), Bolton and

Scharfstein (1990) and Maurer (1999). When information and incentive problems in financial markets are extensive, financiers are likely to use mechanisms that reduce strategic default incentives and/or investment incentive problems. One such mechanism is a credible project termination threat when profits are low to induce firms to repay their debt (e.g., Gale and Hellwig (1985), Narayanan (1988), Poitevin (1989), Innes (1990), Dewatripont and Maskin (1995)).[4] By committing to a strict enforcement of liquidation rights if a firm's performance is poor, financiers may be able to impose financial discipline on firms, but at a cost of encouraging rivals to ensure that the firm's performance is poor.[5] As a result, the financial vulnerability of some firms may be exploited in a strategic way to cause their exit; through predation, other firms may reduce victims' cash flow and, thus, impair their ability to meet debt service payments. The success of this type of predation crucially depends on preys having limited access to – whether internally generated or externally contracted – funds ("shallow pockets"), which makes it hard for these firms to sustain losses. As a result, industry incumbents may have an incentive to prey upon firms when information asymmetries with financiers are substantial so as to influence investors' beliefs on quality and/or behavior (incentive problems).

According to Bolton, Brodley and Riordan (1999), there are five conditions in order for financial market predation to be a viable predatory strategy. We argue that each of these conditions is typically fulfilled in the case of business start-ups. A first condition is that the prey is highly dependent upon external financing. Empirical evidence supports this condition for start-ups. Holtz-Eakin, Joulfaian and Rosen (1994) find that entrepreneurs on average are liquidity constrained whereas Huyghebaert (2000) shows that newly established ventures in

[4] A similar reasoning applies for financiers who provide equity finance (venture capital in the case of newly established firms). The finance literature (e.g., Sahlman (1990), Gompers (1995)) has demonstrated that venture capitalists *stage* investment contracts in order to curb moral hazard problems. However, in Continental Europe, venture capital can be raised only by firms in specific industries and venture capitalists typically only finance firms in the growth stage (Ooghe, Manigart and Fassin (1991), Van Hulle (1998), Black and Gilson (1998)).

traditional industries are highly levered at the time of start-up. In addition, Laitinen (1994) argues that initial cash flow generation of start-ups is highly uncertain and potentially negative, which makes it highly unlikely that internally generated funds are an important source of financing in the first few years after start-up. The second condition is that the prey's external financing depends upon its initial performance. There is substantial evidence demonstrating that investors structure financing deals in different stages when information and incentive problems are substantial, which makes additional financing dependent upon previous operating results (e.g., Abraham (1997), Gompers (1995)). Third, predation threatens the prey's continued financing and viability. Innes (1990), for example, argues that this will be the case when investors have committed to terminate funding under poor performance. This condition usually holds for start-ups. Fourth, the predator understands the prey's dependence on external financing and fifth, the predator can finance predation internally or has substantially better access to credit than the prey. The latter condition corresponds to the idea that predators have relatively deep pockets (Telser (1966)). When compared to business start-ups, firms with an established track record are likely to have better access to external financing (e.g., Diamond (1991)) and/or to have larger recourse to internally generated resources.

B. The Competitive Strategy Measure (CSM)

As argued by Bulow, Geanakoplos and Klemperer (1985), Showalter (1988), Tirole (1988) and others, many results from oligopoly theory critically depend upon the type of competition that is assumed to exist between firms, i.e. whether competition is in strategic complements or substitutes. Intuitively, the idea of strategic complements is that competitors match a firm's strategic move and, thus, compete fiercely. This type of behavior, therefore, could also be considered as non-cooperative strategic behavior. With strategic substitutes, competitors accommodate a firm's strategic move, thereby decreasing competition – see our above

[5] On the other hand, if they commit to a continuing supply of funds, for instance by extending an irrevocable credit line, they may be able to deter predation, but may be encouraging agency misconduct on the part of their

discussion on cooperative strategic behavior. This distinction, however, is not captured by traditional concentration measures.

Sundaram, John and John (1996) operationalize the notion of competition in strategic complements versus substitutes by constructing an empirical measure of the responsiveness of a firm's marginal profits (i.e., the change in its profits relative to its own output) to changes in its competitors' output. In other words, what determines competitive behavior as strategic complements or substitutes is the sign of the change in a firm's profits with respect to changes in both its own and its competitors' output. When the CSM is positive, competition is said to be in strategic complements, whereas a negative CSM indicates competition in strategic substitutes.

III. SAMPLE

Our sample consists of 235 true business start-ups from the Belgian manufacturing sector, that started their operations in 1992 and that report positive employment in the year of start-up. Each of these firms is protected by limited liability, as this is a requirement for firms to be obliged to file their financial statements with the National Bank.[6] We verified that each firm in the sample was a true start-up and not a split-up, diversifying entrant, or other non-true start-up (foundation charter abstract, telephone calls). For each of these firms, we have accounting and

borrowers.

[6] For the year 1991, we have computed that 77.03% of all firms with positive employment (i.e. have paid employees) in the manufacturing industry are protected by limited liability and, therefore, are legally required to file their financial statements with the Belgian National Bank. Even though our data set does not fully cover the population of firms with paid employees, a primary advantage of this data set is that information is available from outside the labor market field, for instance on financial structure.

employment data over the years 1992-1999. We have access to similar information on the corresponding four-digit NACE industry incumbents over the time span 1988-1999.[7]

This cohort of 235 start-ups is subsequently followed until December 1999 and, conform to the literature, exit is determined at the time the firm's employment falls to zero and does not become positive again in subsequent years (e.g., Wagner (1994), Mata and Portugal (1994)). From Table I, it can be concluded that a substantial number of the firms in our sample exit during the first few years after start-up. Specifically, by the end of the sampling period, 48.51% of the firms are considered as exits. This figure is only somewhat lower than the exit rates reported by Dunne, Roberts and Samuelson (1988), Mata and Portugal (1994) and others. Table II gives some information on the industry distribution of the sample firms, respectively survival rates. It seems that our sample is over-represented in a few industries, in particular the food, drink and tobacco industry, the timber and wooden furniture industry, and the manufacture of paper and paper products; printing and publishing industry. Though, note that our sample represents the population of true entrants with paid employees for the year 1992 and, therefore, our study does not suffer from a sample selection bias (Zmijewski (1984)).

Our data set of true business start-ups is well suited to study the effects of competition because, as argued above, strategic interactions may be important when firms are asymmetric, not so much in size, but in terms of information and reputation. This asymmetry is likely to be

[7] Our industry data set covers a wide range of firms that are operating in Belgium and only considers the Belgian activities of foreign firms. Subsidiaries of foreign firms that are incorporated under Belgian law automatically are subject to the obligation to file their financial statements (simple and possibly consolidated annual accounts). Since we only consider the simple annual accounts of true Belgian firms, we also only consider the subsidiaries' simple and not their consolidated annual accounts. Next, branches of foreign firms are obliged to file the foreign firm's annual accounts with the National Bank and are allowed to file annual accounts at the branch level (which thus only relate to their Belgian activities). The National Bank incorporates the annual accounts of branches in its CD-ROMs as far as the filed accounts concern their Belgian activities. From a discussion with people at the National Bank, it has become clear that only the large branches of foreign firms file separate financial statements with the Bank. Finally, note that Sleuwaegen and Dehandschutter (1991) find that the degree of import penetration does not have a significant impact upon entry and exit rates in Belgian manufacturing industries. They interpret their finding of low import penetration as potentially reflecting a strong preference to locate in Belgium instead of exporting to the Belgian market.

especially pronounced between incumbents and entrants. At the time of start-up, uncertainty about future cash flow generation can be expected to be relatively high. Furthermore, unlike existing studies that define entry at the plant level, information and incentive problems in financial markets can be expected to be more severe with de novo entrants than with diversifying entrants (new plants established by existing firms). Diversifying firms are likely to have a reputation in one or more industries, that may carry over to any new industry they enter.

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Insert Tables I and II
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We use the hazard rate methodology (duration analysis) to model the conditional exit probability of business start-ups. In this study, the explanatory variable of specific interest is the nature of industry competition. From the above discussion, it has become clear that initial financial structure may also influence the survival chances of newly established firms: when information and incentive problems are substantial, financiers are likely to adopt a harsh liquidation policy for firms that default to curb these problems. The other firm and industry level variables that are included are those earlier studies have found to influence post-entry survival. These variables capture firm start-up size, scale economies, industry turbulence, sunk costs and industry growth.[8, 9] Finally, we also control for the fact that overall macro-economic conditions may influence post-entry survival, as is done in Mata, Portugal and Guimarães (1995), for example. In previous studies (e.g., Wagner (1994), Audretsch (1995)), different

[8] Other firm level variables that have been included in previous studies are a dummy variable that is set to one when the new plant is a new firm and zero otherwise (Audretsch and Mahmood (1995)), and the number of plants operated by the firm (Mata and Portugal (1994)). Since we study true business start-ups, there is no or only few cross-sectional variation in these variables, which is the reason why they will be ignored in this study.

[9] There is also evidence that post-entry survival is influenced by the underlying technological regime in the industry, as shown in Acs and Audretsch (1993), among others. In markets where innovative activity is dominated by large enterprises (*routinized* technological regime), the process of firm selection can be characterized as a revolving door, where the bulk of new entrants exit the industry within a short period following entry. Conversely, in some industries, new entrants may be at a technological advantage (*entrepreneurial* technological regime) and displace incumbent firms following entry by driving them out of the market. Unfortunately, we have no information available that could be used to proxy for the industry technological regime. However, Acs and

cohorts of entrants are followed over time, while we examine only a single cohort. Consequently, the aging pattern of the firms in our sample may be entangled with overall industry and/or macro-economic effects. When these are not fully captured by our control variables, a spurious aging pattern might result. As the interest of our model lies in identifying the impact of competition upon exit, we do not estimate an aging pattern. A similar approach is adopted in Mata and Portugal (1994) and Audretsch and Mahmood (1995).

Hereafter, we discuss our measurement of firm and industry level variables. To measure firm *start-up size*, we use the logarithm of the number of employees in the start-up year. Initial financial structure is measured by the firm's *leverage*, i.e. debt relative to total resources in the start-up year.[10] The industry minimum efficient scale (MES) is proxied by the median of the logarithm of the number of employees of firms older than ten years in the corresponding four-digit NACE industry for the year 1991 (*scale economies*).[11] By considering only the older firms in the industry, this variable takes into account that entry may occur at a small scale and that entrants that discover themselves to be efficient may grow towards the MES. Furthermore, Biggadike (1979) and McDougall et al. (1994) find that after eight years, new ventures begin to resemble the characteristics of established firms, which is the reason why we consider firms older than ten years as the established firms in the industry (see also Acs and Audretsch (1993)). Industry turbulence is proxied by the extent of gross entry in the industry (*entry rate*) and by the proportion of firms that are smaller than the industry MES (*size distribution*), both measured in 1991. Mata and Portugal (1994) argue that the latter variable can be considered as a measure for turbulence that controls for market size. Also, industries that are characterized by

Audretsch (1989) show that the extent and nature of innovative activity is directly related to the amount of turbulence in an industry, for which we control in our study.

[10] To calculate total resources in the start-up year, we undo the balance sheet of the first accounting year from the proceeds realized during the first year, i.e. we remove retained earnings and reserves built up. Also, balance sheet items that do not correspond to flows of money (e.g., surplus values from revaluation, provisions, etc.) are not considered as a source of financing. Finally, loans extended by the entrepreneurs to their firm are not considered as debt, but rather as equity financing since it can be argued that this debt is like a form of preferred equity finance (see Huyghebaert (2000)).

high gross entry are likely to be the ones where it is hard for entrants to obtain an enduring presence in the market. *Sunk costs* are proxied by the fraction of total assets that is represented by machinery and equipment in the industry for the year 1991. When machinery and equipment represent a relatively large fraction of total assets, the liquidation value of firm assets can be expected to be rather low, ceteris paribus. To measure the extent of industry competition, we use both the industry *CR4 concentration ratio* and the *CSM*.[12] In order to construct the latter variable, data is needed on the profits and the output of the firms in a given industry. These are proxied by net income, respectively sales, in line with Sundaram, John and John (1996). We define the set of competitors of a given firm as all firms in the corresponding four-digit NACE industry except for the considered firm. A firm's marginal profit then is measured as the ratio of the change in its net income $\Delta\Pi^f$ to the change in its sales ΔS^f. Next, we derive the change in its competitors' output ΔS^c and, conform to Sundaram, John and John (1996), compute the coefficient of correlation between $\Delta\Pi^f/\Delta S^f$ and ΔS^c over all firms in a given industry.[13] Industry growth is assessed by means of historical (one year lagged) *sales growth*, averaged across all firms in that particular industry. We allow industry growth rates to vary from year to year. Finally, business cycle effects are gauged by means of time varying (TV) one year lagged *real GNP growth*. To limit the influence of outliers, explanatory and

[11] To control for the fact that some industry incumbents may have zero employment, one is added before taking the logarithm of employment in our measures of firm size.

[12] In other studies, some pitfalls may have been associated with measuring concentration, which might also explain why these studies find no systematic impact of competition (concentration) upon exit. In particular, many concentration measures are biased because of an improper definition of the relevant market. According to Martin (1988), the economic market for a product should include all goods that significantly influence the price of that product. If transport costs are very high, then the relevant economic market is the local market and national concentration statistics may wrongly understate market concentration. Similarly, concentration measures are often biased because they ignore imports. Sleuwaegen and Dehandschutter (1991) argue that Belgium is a small open economy, which has implications for measuring concentration. As Belgium is a *small* economy, the distinction between local and national markets may be less pertinent, particularly when examining start-ups in manufacturing. As Belgium is an *open* economy, it is necessary for this study to have imports included in measures of industry sales (see footnote 7). In sum, traditional concentration measures in our study are less likely to suffer from the above discussed biases. This makes it particularly interesting to also investigate the relation between industry concentration and post-entry exit in our study.

[13] Sundaram, John and John (1996) compute a CSM *per firm* using data on the preceding 40 quarters for each firm to study the announcement effect of R&D spending. In our study, we consider entrants that have no track record and, therefore, compute this CSM *at the industry level*. In other words, we consider each firm separately, identify its competitors and then calculate the correlation coefficient between $\Delta\Pi^f/\Delta S^f$ and ΔS^c over all firms in a given four-digit NACE industry.

control variables are winsorized at the 1-99% percentiles. In Table III, we provide some summary statistics on explanatory and control variables, whereas in Table IV, we present the pairwise correlations among these variables.

In Table III, we observe that the sample firms are rather small: on average, they employ 3.67 persons (median of two) in the year of start-up, whereas total resources amount to 318674 €. Next, the start-ups in our sample are highly levered, which is likely to make them extremely vulnerable to predation. On average, 73% of initial resources come under the form of external debt financing, whereas the median even points to a higher share of external debt as a source of capital. The variable representing *scale economies* shows that in the average industry, the median firm older than ten years employs 13.84 people. Also, this firm's total assets amounts to 969836 €. From the industry *entry rate*, it can be concluded that industry turbulence in our sample is rather limited: in the average industry, firms that start operations during the year 1991 represent 6.41% of the firms that are active at the beginning of that year. The industry *size distribution* shows that on average, 63.64% of the active firms have a smaller scale than the industry MES (employment). Industry machinery and equipment represent 8.16% of total assets in the average industry. Finally, the *CR4 concentration ratio* shows that the industries in our sample on average are relatively highly concentrated (mean *CR4* of 0.3208), whereas the *CSM* indicates that in the average industry, competition is in strategic complements (a positive value of 0.0433 for the *CSM*). The distribution of the *CSM* in our study is highly comparable to that in the original study by Sundaram, John and John (1996).

From Table IV, it can be concluded that the competition variables, *CR4* and *CSM*, measure different aspects of market structure. When comparing their correlation with the other industry level variables, we find that the *CR4 concentration ratio* is significantly negatively correlated with the variables that represent the industry *size distribution* and the extent of *sunk costs*. This

indicates that in industries where a substantial number of firms are operating below the MES and in industries where machinery and equipment represent a relatively high fraction of total assets, market structure is less concentrated. The *CSM*, on the other hand, is significantly and positively related to the variables *scale economies*, *entry rate* and *sunk costs*. So, in industries characterized by important scale economies, substantial entry and high sunk costs, competition among incumbent firms is much fiercer. Also, note the relationship between the *CR4 concentration ratio* and the *CSM* in our sample: when industries are highly concentrated, competition is tough; the correlation coefficient between these two variables amounts to a highly significant $\rho = 0.3257$. To conclude, note that the pairwise correlations in Table IV suggest that multicollinearity is not likely to be a problem in our study since none of the correlation coefficients is greater than 0.7, which is the cutoff rule recommended by Judge et al. (1988).

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Insert Tables III and IV
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IV. EMPIRICAL RESULTS

To study the instantaneous probability of exit, conditional upon survival until that period (hazard rate), we use duration analysis – see Mata and Portugal (1994), Van de Gucht (1994) and Audretsch (1995) for a discussion of the methodology. The main advantages of this methodology for our study are that survival analysis can include time varying covariates and that it takes into account that start-ups that have survived the sampling period (censored observations) may still exit later on. Since we are not particularly interested in estimating the aging pattern, as was argued in the previous section, we assume that the event time follows an

exponential distribution.[14] The various models reported in Table V mainly differ with respect to the measurement of the competitive effect. We start by discussing the results in Part 1. The effect of competition in Model A is captured by the *CR4 concentration ratio*, whereas the *CSM* is used in Model B.

The results of Models A and B in Part 1 indicate that firms starting up with more employees are significantly less likely to exit in the years following start-up. This finding is consistent with earlier empirical evidence. However, from this study, we cannot tell whether we observe a learning effect or an inherent size disadvantage for the smaller start-ups in the sample; given that we control for the industry MES, firms that start up at a larger size may just as well find it easier to survive as scale diseconomies can be expected to be less detrimental for larger start-ups. Next, we observe that highly levered firms are significantly less likely to exit, a result that conflicts with the arguments made in section two. A possible explanation for this counterintuitive relation between initial leverage and exit might be the positive relation that exists between the variables *start-up size* and *leverage* (see Table IV). Unlike other studies that define entry at the plant level, firm *start-up size*, being a discrete variable, exhibits relatively few cross-sectional variability in our sample of de novo entrants. Then, the variable *leverage* may capture better genuine size differences across firms. To test for this hypothesis, we use the logarithm of total assets as the metric to express firm size (*start-up size* and *scale economies*), which is the variable used in the finance literature.[15] These results are represented in Part 2 of Table V (Models A and B). We indeed find that the relation between firm *leverage* and exit is no longer significant. The results with respect to the other variables are unaffected in Models A and B, which is the reason why we concentrate on Part 2 of this Table henceforth.

[14] Even if there is an aging pattern, this operationalization is unlikely to bias parameter estimates as we control for the presence of unobserved individual heterogeneity using the gamma distribution. Next, given that ordered probit and logit models are less sensitive to the presence of individual heterogeneity (Han and Hausman (1990)), we also have estimated an ordered logit model and find that our results are robust.

Unlike other studies (e.g., Audretsch (1991), Audretsch and Mahmood (1995)), Models A and B indicate that *scale economies* have no significant impact upon new firm survival. This might result from new entrepreneurial ventures being active in particular market niches, as argued by Caves and Porter (1977), among others. Then, local conditions in those niches may be more important to the survival of newly established firms. This conclusion is likely to be reinforced by the results of Acs and Audretsch (1989), Evans and Siegfried (1992) and others, who find that entry is not substantially deterred in industries where scale economies are important. Next, we find that in both models, the industry *entry rate* is positively and significantly related to post-entry exit, which is consistent with our earlier arguments on industry turbulence. The variables that capture the industry *size distribution* and *sunk costs*, however, are not significantly related to the likelihood of exit. When comparing the impact of competition upon exit across the two models, we find that the *CR4 concentration ratio* is not significantly related to post-entry exit (Model A). This result is not surprising, given our earlier discussion on the shortcomings of traditional concentration ratios. In particular, these measures of competition generally mask the separate influences of strategic complements versus substitutes. When using the *CSM* to proxy for the nature of industry competition (Model B), we find that start-ups are significantly more likely to exit from their industry when competition is aggressive rather than accommodating, ceteris paribus.[16] Finally, we find that when industry *sales growth* or *real GNP growth* is high, firms are significantly less likely to exit. Start-ups apparently find it easier to survive in fast growing industries or during periods of economic expansion.

To examine more thoroughly the impact of competition upon post-entry survival, we present some additional models. We first create separate variables for when competition is in strategic

[15] Also, when we discretize the variable *leverage* using five dummy variables, we find that there is no independent leverage effect upon exit and that the variable *start-up size* (logarithm of employees) becomes more negatively (and more significantly) related to exit.

[16] The fact that we find that the entrants in our sample suffer from aggressive reactions from incumbents is not surprising; from the 69 firms that responded to a questionnaire that was sent out, 31.8% indicate that they

complements versus substitutes. The results of Model C indicate that the competitive effect holds under both types of strategic interactions, even though the parameter estimate associated with strategic substitutes (*CSM if negative*) has a larger value than that associated with strategic complements (*CSM if positive*). Though, the null hypothesis of identical parameter estimates cannot be rejected at $\alpha = 0.10$, but lies at the boundary of the rejection region (p-value of 0.1155). Interestingly, Model D shows that the interaction term between the *CSM* and the entrant's initial *leverage* is significantly positively related to exit, whereas the simple *CSM* term becomes insignificantly related to exit. From comparing the log-likelihood value across Models B and D, we observe that this interaction term has high explanatory power. Together, these findings reveal that the interaction between the nature of industry competition and the firm's initial financial structure is highly important for explaining post-entry survival. This result could be driven by financial market predation. Then, highly levered firms are especially vulnerable to non-cooperative interactions within the industry. High leverage reduces both operating and financing flexibility, thereby enhancing the probability of default (e.g., Wruck (1990), Jensen (1993)). Model E, lastly, supports the idea that highly levered firms are especially vulnerable to non-cooperative actions by industry incumbents as only the interaction term between *CSM if positive* and *leverage* is significantly different from zero. However, the null hypothesis of identical parameter estimates for the variables *CSM if positive* * *leverage* and *CSM if negative* * *leverage* cannot be rejected (p-value of 0.3701). From comparing the log-likelihood value across Models D and E, we can conclude that Model D, which does not impose the restriction that the interaction term goes through the origin, has highest explanatory power. Finally, from comparing Models A to E, we can conclude that the results for the firm, industry and economy-wide variables are largely insensitive to the measurement of competitive conditions. Though, when allowing for a separate impact of strategic interactions (strategic complements versus substitutes), we find some weak evidence that when firm assets are

experienced aggressive reactions from industry incumbents following entry. 18.2% of firms even assign the highest score that could be given on the scale to this item.

relatively sunk, start-ups are less likely to subsequently exit from the industry. This result is consistent with the argument of Dixit and Pindyck (1996) that the option value of waiting is important under these circumstances.

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Insert Table V
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Interaction terms, however, do not allow to make inferences on the causality of relationships. An alternative explanation for the above significant interaction term *CSM * leverage* (Model D), therefore, may be that the leverage effect depends upon the nature of industry competition. This could occur when financiers are likely to decide in favor of liquidation following default when competition is severe simply because it has become clear that the firm's prospects are rather dim, without this being a matter of predation. The reason is that in highly competitive industries, firms cannot earn more than a normal rate of return on their invested capital. Firms that are more highly levered at start-up then may be more likely to default and, therefore, be liquidated by their financiers. Model E then could be considered as consistent with this alternative explanation as only the interaction term between *CSM if positive * leverage* is significant. The following tests are set up to disentangle the predation hypothesis from this alternative hypothesis. We investigate whether the above results continue to hold both under small versus potentially severe information and incentive problems at the time of start-up. Financial market predation models suggest that especially when information and incentive problems in financial markets are substantial, rival firms have an incentive to engage in predation so as to influence investors' perceptions on the quality and/or behavior of the firm. Conversely, when the alternative hypothesis best describes the underlying process, we should find that the interaction term is significant, independent of information and incentive problems at start-up.

In Table VI, we examine how risk shifting problems affect our above conclusions. We argue that risk shifting incentives are especially high for firms that are likely to fail and have liquid assets. Entrepreneurs have typically invested a substantial part of personal wealth and human capital in their firm and, therefore, can be expected to be relatively risk averse during the normal course of their business. However, once their firm is heading towards financial distress, entrepreneurs may face huge incentives to shift risks to external creditors in order to turn the tide. After all, asymmetric or imperfect information makes it impossible for creditors to write enforceable state contingent contracts, that could have circumvented these problems. Furthermore, it can be argued that risk shifting is especially problematic when asset liquidity is high, ceteris paribus. Wen assets in place have a relatively high liquidation value, entrepreneurs will find it easier to raise cash by selling firm assets. As a result, it can be expected that financiers will be largely concerned about risk shifting incentives when the ex ante likelihood of default and the liquidation value of assets are high, ceteris paribus. Therefore, we use the interaction term between the ex ante likelihood of failure and the liquidity of firm assets to classify the firms in our sample on the basis of the ex ante potential for risk shifting problems. We first split the sample using the 50% percentile, i.e. the median. In addition, we also report results for firms with a value below the 40% and above the 60% percentile of the variable *industry failure risk* * *industry asset liquidity*. The ex ante likelihood of failure is measured by the industry failure (bankruptcy) risk of entrants founded over 1988-1991, which then are tracked over a three year period following entry. This measure can be readily assessed by external financiers. Liquidity of firm assets is proxied by the ratio of accounts receivable, cash and marketable securities relative to total assets, averaged across all firms in the corresponding four-digit NACE industry.

Our empirical results in Table VI indeed indicate that the interaction term between the *CSM* and *leverage* has a significant positive impact upon exit, but only when the ex ante potential

for risk shifting is substantial, i.e. when the risk shifting measure is above the median.[17] The result from a *t*-test indicates that the parameter estimates for *CSM* * *leverage* are significantly different across the two subsamples of firms with a value below, respectively above the median of the variable *industry failure risk* * *industry asset liquidity* (*p*-value of 0.0973). This conclusion is reinforced when comparing the parameter estimates for the subsamples in columns one (below 40% percentile) and four (above 60% percentile). Next, we find that the negative size effect is highly important for explaining the likelihood of post-entry exit both for all subsamples of firms. Finally, we find that the above documented industry effects are significant only for firms with substantial information and incentive problems in financial markets at start-up. This result could be explained by the binding financial constraints that these firms are likely to face, making it more difficult to overcome inherent disadvantages at the industry level.

In Table VII, we use the interaction term between the ex ante likelihood of failure and growth opportunities to classify the sample firms in order to examine the impact of risk shifting and/or underinvestment incentives on our earlier conclusions from Table V. Growth opportunities at start-up are proxied by the historical industry growth rate in total assets over 1988-1991. It can be argued that when growth opportunities are substantial and when, due to information problems, state-contingent contracts cannot be written, firms may underinvest and/or may find it easier to engage in risk shifting (by redirecting the firm's assets towards other ends when exercising investment options). Again, as discussed in the previous paragraph, these incentive problems can be expected to be most problematic when the firm is heading towards financial distress. Our empirical results indicate that the positive parameter estimate of *CSM* * *leverage* becomes larger (and more significant) when ex ante information and incentive problems

[17] We have checked whether the cross-sectional variation of the variable *CSM* * *leverage* is different across both subsamples (below versus above the median of the variable that proxies for risk shifting incentives), which might also explain our finding. However, we fail to reject the null hypothesis of identical degrees of diversity (*p*-value of 0.9999 when using an *F*-test).

increase. However, a *t*-test indicates that the parameter estimates for the variable *CSM* * *leverage* are not significantly different even across the subsamples of firms with a value below the 40% percentile, respectively above the 60% percentile of the variable *industry failure risk* * *industry growth opportunities* (*p*-value of 0.1532). Again, we find that industry level variables have a significant impact upon exit only for the firms with large information and incentive problems at the time of start-up.

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Insert Tables VI and VII
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V. CONCLUSIONS

The importance of market power, which is the ultimate goal of predation, has been the subject of a long and still ongoing debate between economists who lean towards the Structure-Conduct-Performance school and advocates of the Chicago school. The first group believes that the (private) exercise of market power by firms is a persistent feature of many markets and argues that strategic behavior can be used to acquire and maintain the ability to set price above marginal cost. The Chicago school, on the other hand, argues that every firm decision or action can be duplicated by an equally efficient firm, unless some higher power intervenes. Those economists who adhere to this school contend that private market power can only be temporary and that government interference in the market – through blockading entry – is the only source of sustained monopoly power.

In this paper, we find support for the theoretical argument that industry incumbents engage in predatory practices so as to influence the perceptions of financiers. In particular, we find that the impact of competition, which is measured by the Sundaram, John and John (1996)

Competitive Strategy Measure, upon exit depends upon the entrant's initial financial structure. Furthermore, we also observe that this effect is only important when information and incentive problems in financial markets are extensive. These findings, therefore, have some important consequences for the effective functioning of markets. Entry of new competitors is essential not only for introducing new products and processes, but also for enforcing competitive discipline on markets. Since we examine entrants in traditional manufacturing industries, which typically are more evolved in their industry life cycle, the imposition of market discipline is likely to be a major contribution of entry.[18] When scale economies provide large, established firms already with an advantage when compared to small scale start-ups – perhaps because they find it difficult to secure external funds – it may be difficult for entrants to obtain an enduring presence in the market. Likewise, under these circumstances, entrants may find it hard to impose discipline on industry incumbents, which, according to the Chicago School, is necessary to curb incumbent market power. Post-entry survival may become even more burdensome when industry incumbents engage in predation. Learning-by-doing similarly can place entrants in an unfavorable starting position. In sum, scale economies and learning-by-doing may even become larger entry barriers in the presence of predation. The detection of predatory behavior in our study, therefore, inevitably has implications for public policy.

Martin (1988) argues that the study of predation by economists has largely consisted of the formulation or criticism of rules offered to courts for use in deciding on antitrust cases, which makes us extremely wary when formulating implications for antitrust policy, i.e. the policy by which the government sets the rules according to which independent firms compete. A frequently adopted decision rule by courts in the U.S. is that there is evidence in favor of predation when the price is below short-run marginal cost, which then is approximated by

[18] In the early stage of the industry life cycle, firms enter essentially by introducing innovations that are embodied in new products or processes and while some are successful and prosper, a large number never acquire buyers' acceptance and quickly leave the market. In the later stages of the industry life cycle, industries can still be

average variable cost (known as the Areeda-Turner rule). Though, our main critic also applies to this rule: it is not necessary for established firms to price below short-run marginal cost if entrants have higher marginal costs (suffer from diseconomies of scale or are at the beginning of the learning curve, which may be triggered by financial constraints).

Setting a price above the incumbent's short-run marginal cost, but below the entrant's marginal cost may be profitable *only* because of its negative impact on the survival chances of existing or potential entrants, which in essence is what predation is about. Under these conditions, it can seem as if competition is doing its work even though consumers may not be better off in the long-run. Therefore, we adhere to the adoption of a "Rule of Reason Approach", as posited by Scherer (1974). This rule takes the relative cost positions of different rivals, scale economies, etc. into account and, therefore, recognizes that predation is a multifaceted phenomenon, that cannot be identified by a single factor. By collecting information on all relevant economic factors, the likelihood of a bias in the direction of a conservative or populist position can be minimized (see De Bondt (2000)). Even though administrative costs associated with this rule are likely to be substantial, a correct application of this rule can be expected to deter predation in the long-run and, thus, making administrative costs an unlikely expense.

technologically intensive, but Agarwal and Audretsch (1998) show that entry is less about radical innovation and more about filling strategic niches.

Table I: Timing of exit

This Table represents the number of start-ups that exit at a given age (completed observations), respectively that survive until a given age and on which no subsequent data is available on exit/survival (censored observations).

	Age=1	Age=2	Age=3	Age=4	Age=5	Age=6	Age=7	Age=8	Total
Exited firms (completed observations)	42	45	2	8	14	3	0	0	114
Survived firms (censored observations)	0	0	0	0	0	31	69	21	121

Table II: Industry distribution of exit

This Table represents for each two-digit NACE industry, the number of sample firms that start up in that industry and the number of firms that are considered as exits, respectively survivors.

NACE code	Description	Number of firms	Number of exits	Number of survivors
22	Production and preliminary processing of metals	1	1	0
23	Extraction of minerals other than metalliferous and energy-producing minerals; peat extraction	1	0	1
24	Manufacture of non-metallic mineral products	6	4	2
25	Chemical industry	3	1	2
31	Manufacture of metal articles (except for mechanical, electrical and instrument engineering and vehicles)	12	5	7
32	Mechanical engineering	7	4	3
34	Electrical engineering	8	8	0
36	Manufacture of other means of transport	2	1	1
37	Instrument engineering	9	3	6
41/42	Food, drink and tobacco industry	41	21	20
43	Textile industry	14	5	9
44	Leather and leather goods industry (except footwear and clothing)	2	1	1
45	Footwear and clothing industry	19	10	9
46	Timber and wooden furniture industries	27	12	15
47	Manufacture of paper and paper products; printing and publishing	65	30	35
48	Processing of rubber and plastics	5	2	3
49	Other manufacturing industries	13	6	7
TOTAL		235	114	121

Table III: Summary statistics on explanatory and control variables

This Table represents the summary statistics for the variables used in this study. Firm *start-up size* is measured in terms of the number of employees, total resources and total assets in the start-up year, *leverage* is the ratio of total debt to total resources in the start-up year, the industry MES (*scale economies*) is proxied by the median of the number of employees, respectively total assets of firms older than ten years in the corresponding four-digit NACE industry in 1991, *entry rate* is the gross entry rate in the corresponding industry in the year 1991, *size distribution* is the proportion of firms that are smaller than the corresponding industry MES (employment) in the year 1991, *sunk costs* are proxied by the fraction of total assets that consist of machinery and equipment in the corresponding industry for the year 1991, the *CR4 concentration ratio* represents the market share of the largest four firms in the corresponding industry and *CSM* measures the responsiveness of marginal profits with respect to changes in competitors' output in the corresponding industry.

Variable	Mean	Median	Minimum	Maximum	Std. dev
Firm level variables					
Start-up size (employment)	3.6681	2	1	38	4.8798
Start-up size (total resources)	318674€	140530€	10213€	8505081€	703696€²
Start-up size (total assets)	305985€	141175€	7933€	8505875€	686508€²
Leverage	0.7300	0.8158	0.0395	0.9930	0.2249
Industry level variables					
Scale economies (employment)	13.8433	8.5	1	223	23.5773
Scale economies (total assets)	969836€	390960€	92142€	20968446€	2418310€²
Entry rate	0.0641	0.0543	0	0.3077	0.0503
Size distribution	0.6364	0.6355	0.4074	0.8088	0.0821
Sunk costs	0.0816	0.0779	0	0.2216	0.0514
CR4 concentration ratio	0.3208	0.3277	0.0995	0.8989	0.1989
CSM	0.0433	0.0447	−0.1826	0.5142	0.1093

Table IV: Correlation matrix

This Table represents the correlations among the variables used in this study. *start-up size* is the logarithm of the number of employees in the start-up year, *leverage* is the ratio of total debt to total resources in the start-up year, *scale economies* are proxied the median of the logarithm of the number of employees of firms older than ten years in the corresponding four-digit NACE industry in 1991, *entry rate* is the gross entry rate in the corresponding industry in the year 1991, *size distribution* is the proportion of firms that are smaller than the corresponding industry MES in the year 1991, *sunk costs* are proxied by the fraction of total assets that consist of machinery and equipment in the corresponding industry for the year 1991, *CR4* represents the market share of the largest four firms in the corresponding industry and *CSM* measures the responsiveness of marginal profits with respect to changes in competitors' output in the corresponding industry.

	Start-up size (employment)	**Leverage**	**Scale economies**	**Entry rate**	**Size distribution**	**Sunk costs**	**CR4**	**CSM**
Start-up size (employment)	1.0000							
Leverage	0.2501***	1.0000						
Scale economies (employment)	0.1304**	0.0377	1.0000					
Entry rate	−0.0321	−0.0212	−0.2071***	1.0000				
Size distribution	−0.0332	0.0538	0.1880***	0.2228***	1.0000			
Sunk costs	0.0072	0.0075	0.3138***	−0.0545	0.2493***	1.0000		
CR4	0.0161	−0.0453	0.0662	−0.0396	−0.2974***	−0.1937***	1.0000	
CSM	0.0601	−0.0355	0.2105***	0.2144***	−0.0486	0.1648**	0.3257***	1.0000

*: significant at 10%
**: significant at 5%
***: significant at 1%

Table V: Regression Results for Different Model Specifications

The sample period is 1992-1999. All data are obtained from the Belgian National Bank. The various models mainly differ with respect to the specification of the competitive effect. The firm level variables that are included are measured during the start-up year, whereas the industry level variables are measured in the year preceding entry (1991). *start-up size* is the logarithm of the number of employees (Part 1), respectively total assets (Part 2), *leverage* is the ratio of total debt to total resources, *scale economies* are proxied the median of the logarithm of the number of employees (Part 1), respectively total assets (Part 2) of firms older than ten years in the corresponding four-digit NACE industry, *entry rate* is the gross entry rate in the corresponding industry, *size distribution* is the proportion of firms that are smaller than the industry MES, *sunk costs* are proxied by the fraction of total assets that consist of machinery and equipment in the corresponding industry, the *CR4 concentration ratio* represents the market share of the largest four firms in the industry, *CSM* measures the responsiveness of marginal profits with respect to changes in competitors' output in the industry, *sales growth* is the one year lagged sales growth rate, which is allowed to vary over time and *real GNP growth* is the one year lagged growth rate in real GNP, which is also time varying (TV).

	Part 1 (size in employment)		Part 2 (size in total assets)				
	Model A	Model B	Model A	Model B	Model C	Model D	Model E
h_0 (baseline exit rate)	1.0697	1.1717	2.1709	4.8026	2.4898	17.9341	7.0702
Firm level variables							
Start-up size	−0.4070*	−0.4292*	−0.7072***	−0.6997***	−0.6655***	−0.6785***	−0.6511***
Leverage	−0.3225***	−0.3298***	−0.1065	−0.1163	−0.1054	−0.2272*	−0.1827
Industry level variables							
Scale economies	0.3267	0.2044	0.1415	0.0856	0.1477	−0.0363	0.0223
Entry rate	8.7740***	7.3972**	6.4378**	5.3875*	4.7385*	7.4651**	4.5362*
Size distribution	−0.8720	−0.4339	−0.7836	−0.8044	−0.7230	−0.2876	−0.4413
Sunk costs	−3.6910	−4.3309	−0.9748	−2.1831	−4.6949*	−2.3301	−4.8546*
CR4 concentration ratio	−0.0238		0.4928				
CSM		2.1017*		1.9431*		−0.1132	1.3167
CSM if positive					1.6876*		
CSM if negative					4.7798*		
CSM * leverage						2.0399***	
CSM if positive * leverage							1.1704**
CSM if negative * leverage							1.6338
Sales growth (lagged; TV)	−3.0029**	−3.1665***	−2.9785**	−3.1183***	−2.8285**	−3.3243***	−3.0672***
Macro-economic conditions							
Real GNP growth (lagged; TV)	−4.0387***	−4.0918***	−4.0753***	−4.1360***	−3.9288***	−4.1410***	−3.9621***
LL	−319.1732	−318.0273	−310.4235	−309.4563	308.0944	−307.1809	−307.2850
N	235	235	235	235	235	235	235

*: significant at 10%
**: significant at 5%
***: significant at 1%

Table VI: Split Sample Regression Results for Model D - risk shifting incentives

The sample period is 1992-1999. All data are obtained from the Belgian National Bank. Model D, Part 2 from Table V is estimated for different subsamples, depending upon the severity of risk shifting incentives. The interaction variable *industry failure risk * industry asset liquidity* is used to classify the firms in the sample. Firms with a value below the median (< 50%) are compared to those with a value above the median (> 50%). In addition, we also report results for firms with a value below the 40% and above the 60% percentile of the variable *industry failure risk * industry asset liquidity*.

The firm level variables that are included are measured during the start-up year, whereas the industry level variables are measured in the year preceding entry (1991). Firm *start-up size* is the logarithm total assets, *leverage* is the ratio of total debt to total resources, *scale economies* are proxied by the median of the logarithm of total assets of firms older than ten years in the corresponding four-digit NACE industry, *entry rate* is the gross entry rate in the corresponding industry, *size distribution* is the proportion of firms that are smaller than the industry MES, *sunk costs* are proxied by the fraction of total assets that consist of machinery and equipment in the corresponding industry, *CSM* measures the responsiveness of marginal profits with respect to changes in competitors' output in the industry, *sales growth* is the one year lagged sales growth rate, which is allowed to vary over time and *real GNP growth* is the one year lagged growth rate in real GNP, which is also time varying (TV).

	Percentiles of the variable Industry failure risk * Industry asset liquidity			
	< 40%	**< 50%**	**> 50%**	**> 60%**
h_0 (baseline exit rate)	71.4299	168.7352	0.0153	0.5323
Firm level variables				
Start-up size	−0.7465***	−0.7555***	−0.6802***	−0.5703***
Leverage	−0.3403*	−0.3342*	−0.1047	−0.3012
Industry level variables				
Scale economies	0.0164	0.0222	0.5372***	0.2067
Entry rate	−0.5984	−0.7217	6.7692*	9.9849*
Size distribution	−4.8503	−5.6815*	1.3289	0.6779
Sunk costs	4.8780	6.3401	−6.3834	−5.9514
CSM	3.3173	3.3487	−1.4358	−2.6893
CSM * leverage	1.2407	1.1149	3.3163**	3.7426**
Sales growth (lagged; TV)	−1.7024	−1.8929	−9.4643***	−10.0707***
Macro-economic conditions				
Real GNP growth (lagged; TV)	−2.0386*	−4.5881***	−3.8681***	−4.2364***
LL	−113.9271	−146.5645	−152.1333	−112.5647
N	94	119	116	87

*: significant at 10%
**: significant at 5%
***: significant at 1%

Table VII: Split Sample Regression Results for Model D - risk shifting and/or underinvestment

The sample period is 1992-1999. All data are obtained from the Belgian National Bank. Model D, Part 2 from Table V is estimated for different subsamples, depending upon the extent of risk shifting and/or underinvestment incentives. The interaction variable *Industry failure risk * Industry growth opportunities* is used to classify the firms in the sample. Firms with a value below the median (< 50%) are compared to those with a value above the median (> 50%). In addition, we also report results for firms with a value below the 40% and above the 60% percentile of the variable *Industry failure risk * Industry growth opportunities*.
The firm level variables that are included are measured during the start-up year, whereas the industry level variables are measured in the year preceding entry (1991). Firm *start-up size* is the logarithm total assets, *leverage* is the ratio of total debt to total resources, *scale economies* are proxied by the median of the logarithm of total assets of firms older than ten years in the corresponding four-digit NACE industry, *entry rate* is the gross entry rate in the corresponding industry, *size distribution* is the proportion of firms that are smaller than the industry MES, *sunk costs* are proxied by the fraction of total assets that consist of machinery and equipment in the corresponding industry, *CSM* measures the responsiveness of marginal profits with respect to changes in competitors' output in the industry, *sales growth* is the one year lagged sales growth rate, which is allowed to vary over time and *real GNP growth* is the one year lagged growth rate in real GNP, which is also time varying (TV).

	Percentiles of the variable Industry failure risk * Industry growth opportunities			
	< 40%	**< 50%**	**> 50%**	**> 60%**
h_0 (baseline exit rate)	85.3809	198.0998	0.0003	0.0043
Firm level variables				
Start-up size	−0.6809***	−0.6862***	−0.7221***	−0.7357***
Leverage	−0.3449*	−0.3509*	−0.0187	−0.0907
Industry level variables				
Scale economies	−0.1118	−0.1381	0.7949**	0.5758*
Entry rate	5.1259	6.7153	4.7566*	5.1434*
Size distribution	−5.7921*	−6.5491*	3.2434*	2.3046
Sunk costs	−3.0422	−0.2593	−5.6604	−3.2632*
CSM	2.4502	1.3646	0.1833	0.6599
CSM * leverage	1.5779	2.0342*	2.4035*	2.6731*
Sales growth (lagged; TV)	−1.2455	−2.0451	−11.4970***	−11.8040***
Macro-economic conditions				
Real GNP growth (lagged; TV)	−4.0861***	−5.0990***	−3.0761**	−3.2176*
LL	−115.8373	−149.0565	−149.8061	−122.2303
N	93	118	117	95

*: significant at 10%
**: significant at 5%
***: significant at 1%

REFERENCES

Abraham, J. P. (1997), *"Comments: Bank Credit and the Stage Process"*, in J. Revell (ed.) *"The Recent Evolution of Financial Systems"*, Macmillan Press, pp. 57-63.

Acs, Z. J. and Audretsch D. B., (1989), *"Small Firm Entry in U.S. Manufacturing"*, Economica, Vol. 56, pp. 255-265.

Acs, Z. J. and Audretsch D. B. (1993), *"Who Exits and Why?"*, discussion paper Research Unit Market Processes and Corporate Development (IIM), Wissenschaftszentrum Berlin für Sozialforschung.

Agarwal, R. and Audretsch (1998), *"Does Start-up Size Matter? The Impact of the Life Cycle and Technology on Firm Survival"*, mimeo University of Central Florida, Orlando.

Audretsch, D. B. (1991), *"New Firm Survival and the Technological Regime"*, Review of Economics and Statistics, Vol. 73, pp. 441-450.

Audretsch, D. B. (1995), *"Innovation and Industry Evolution"*, MIT Press, Cambridge, MA.

Audretsch, D. B., and Mahmood, T. (1995), *"New Firm Survival and the Technological Regime"*, Review of Economics and Statistics, Vol. 77, pp. 97-103.

Bain, J. S. (1956), *"Barriers to New Competition"*, Harvard University Press, Cambridge, MA.

Benoît, J. P. (1984), *"Financially Constrained Entry in a Game with Incomplete Information"*, RAND Journal of Economics, Vol. 15, pp. 490-499.

Biggadike, R. E. (1979), *"The Risky Business of Diversification"*, Harvard Business Review, Vol. 57, pp. 103-111.

Black, B. S. and Gilson, G. D. (1998), *"Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets"*, Journal of Financial Economics, Vol. 47, pp. 243-277.

Bolton, P. Brodley, J. F. and Riordan, M. H. (1999), *"Predatory Pricing: Strategic Theory and Legal Policy"*, Boston University School of Law, Working Paper 99-5.

Bolton, P. and Scharfstein, D. S. (1990), *"A Theory of Predation Based on Agency Problems in Financial Contracting"*, American Economic Review, Vol. 80, pp. 93-106.

Brander, J. and Lewis, T. (1986), *"Oligopoly and Financial Structure: The Limited Liability Effect"*, American Economic Review, Vol. 76, pp. 956-970.

Brander, J. and Lewis, T. (1988), *"Bankruptcy Costs and the Theory of Oligopoly"*, Canadian Journal of Economics, Vol. 21, pp. 221-243.

Bulow, J. Geanakoplos, J. and Klemperer, P. (1985), *"Multimarket Oligopoly: Strategic Substitutes and Complements"*, Journal of Political Economy, Vol. 93, pp. 488-511.

Carlton, D. W. and Perloff, J. M. (1994), *"Modern Industrial Organization"*, HarperCollins College Publishers.

Caves, R. E. and Porter, M. E. (1977), *"From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition"*, Quarterly Journal of Economics, Vol. 91, pp. 241-261.

Chamberlin, E. H. (1933), *"The Theory of Monopolistic Competition"*, Harvard University Press, Cambridge, MA.

Chevalier, J. A. (1995a), *"Capital structure and Product-Market Competition: Empirical Evidence from the Supermarket Industry"*, American Economic Review, Vol. 85, pp. 415-435.

Chevalier, J. A. (1995b), *"Do LBO Supermarkets Charge More? An Empirical Analysis of the Effects of LBOs on Supermarket Pricing"*, Journal of Finance, Vol. 50, pp. 1095-1112.

De Bondt, R. (2000), *"Roofdieren in de markt?"*, Tijdschrift voor Economie en Management, Vol. 45, pp. 253-265.

Dewatripont, M. and Maskin, E. (1995), *"Credit and Efficiency in Centralized and Decentralized Economies"*, Review of Economic Studies, Vol. 62, pp. 541-555.

Diamond, D. W. (1991), *"Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt"*, Journal of Political Economy, Vol. 99, pp. 709-737.

Dixit, A. K. and Pindyck, R. S. (1996), *"Investment under Uncertainty"*, Princeton University Press, New Jersey.

Doi, N. (1999), *"The Determinants of Firm Exit in Japanese Manufacturing Industries"*, Small Business Economics, Vol. 13, pp. 331-337.

Dunne, T., Roberts, M. J. and Samuelson, L. (1988), *"Patterns of Firm Entry and Exit in U.S. Manufacturing Industries"*, RAND Journal of Economics, Vol. 19, pp. 495-515.

Easterbrook, F. H. (1981), *"Predatory Strategies and Counterstrategies"*, University of Chicago Law Review, Vol. 48, pp. 269-270.

Evans, L. B. and Siegfried, J. J. (1992), *"Entry and Exit in United States Manufacturing Industries from 1977 to 1982"*, in D. B. Audretsch and J. J. Siegfried (eds.) *"Empirical Studies in Industrial Organization: Essays in honor of Leonard W. Weiss"*, Studies in Industrial Organization, Kluwer Academic Publishers, Norwell, MA and Dordrecht.

Fisher, F. M. (1990), *"Industrial Organization, Economics and the Law"*, Harvester Wheatsheaf.

Fudenberg, D. and Tirole, J. (1986), *"A 'Signal-Jamming' Theory of Predation"*, RAND Journal of Economics, Vol. 17, pp. 366-376.

Fulghieri, P. and Narayanan, S. (1996), *"On the Strategic Role of High Leverage in Entry Deterrence"*, Journal of Banking & Finance, Vol. 20, pp. 1-23.

Gale, D. and Hellwig, M. (1985), *"Incentive-Compatible Debt Contracts: The One-Period Problem"*, Review of Economic Studies, Vol. 52, pp. 647-663.

Geroski, P. A. (1995), *"What Do We Know About Entry?"*, International Journal of Industrial Organization, Vol. 13, pp. 421-440.

Gertner, R., Gibbons, R. and Scharfstein, D. S. (1988), *"Simultaneous Signaling to the Capital and Product Markets"*, RAND Journal of Economics, Vol. 19, pp. 173-190.

Glazer, J. (1994), *"The Strategic Effects of Long Term Debt in Imperfect Competition"*, Journal of Economic Theory, Vol. 62, pp. 428-443.

Gompers, P. A. (1995), *"Optimal Investment, Monitoring, and the Staging of Venture Capital"*, Journal of Finance, Vol. 50, pp. 1461-1491.

Han, A. and Hausman, J. A., (1990), *"Flexible Parametric Estimation of Duration and Competing Risk Models"*, Journal of Applied Econometrics, Vol. 5, pp. 1-28.

Holtz-Eakin, D., Joulfaian, D. and Rosen, H. S. (1994), *"Entrepreneurial Decisions and Liquidity Constraints"*, RAND Journal of Economics, Vol. 25, pp. 334-347.

Huyghebaert, N. (2000), *"The Capital Structure of Business Start-ups"*, Ph.D. Dissertation, K.U.Leuven.

Innes, R. (1990), *"Limited Liability and Incentive Contracting with Ex-Ante Action Choices"*, Journal of Economic Theory, Vol. 52, pp. 45-67.

Jensen, M. C. (1986), *"Agency Costs of Free Cash Flow, Corporate Finance and Takeovers"*, American Economic Review, Vol. 76, pp. 323-339.

Jensen, M. C. (1993), *"The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems"*, Journal of Finance, Vol. 48, pp. 831-880.

Judge, G. G., Hill, R. C., Griffiths, W. E., Lütkepohl, H. and Lee, T. C. (1988), *"Introduction to the Theory and Practice of Econometrics"*, John Wiley and Sons, New York.

Kovenock, D. and Phillips, G. (1997), *"Capital Structure and Product Market Rivalry: How Do We Reconcile Theory and Evidence?"*, Review of Financial Studies, Vol. 85, pp. 403-408.

Laitinen, E. K. (1994), 'Traditional versus Operating Cash Flow in Failure Prediction', *Journal of Business Finance & Accounting*, Vol. 21, pp. 195-217.

Maksimovic, V. (1988), *"Capital Structure in Repeated Oligopolies"*, RAND Journal of Economics, Vol. 19, pp. 308-407.

Martin, S. (1988), *"Industrial Economics. Economic Analysis and Public Policy"*, Macmillan Publishing Company, New York and Collier Macmillan Publishers, London.

Mata, J. and Portugal, P. (1994), *"Life Duration of New Firms"*, Journal of Industrial Economics, Vol. 42, pp. 227-246.

Mata, J., Portugal, P. and Guimarães, P. (1995), *"The Survival of New Plants: Start-up Conditions and Post-entry Evolution"*, International Journal of Industrial Organization, Vol. 13, pp. 459-481.

Maurer, B. (1999), *"Innovation and Investment under Financial Constraints and Product Market Competition"*, International Journal of Industrial Organization, Vol. 17, pp. 455-476.

McDougall, P.P., Covin, J. G., Robinson, R. B. and Herron, L. (1994), *"The Effects of Industry Growth and Strategic Breadth on New Venture Performance"*, Strategic Management Journal, Vol. 15, pp. 537-554.

Milgrom, P. and Roberts, J. (1982), *Limit Pricing and Entry Under Incomplete Information"*, Econometrica, Vol. 50, pp. 443-459.

Narayanan, M. P. (1988), *"Debt versus Equity under Asymmetric Information"*, Journal of Financial and Quantitative Analysis, Vol. 23, pp. 39-51.

Ooghe, H., Manigart, S. and Fassin, Y. (1991), *"Growth Patterns of the European Venture Capital Industry"*, Journal of Business Venturing, Vol. 6, pp. 381-404.

Ordover, J. A. and Willig, R. D. (1981), *"An Economic Definition of Predation: Pricing and Product Innovation"*, Yale Law Journal, Vol. 91, pp. 8-53.

Phillips, G. M. (1995), *"Increased Debt and Industry Product Markets. An Empirical Analysis "*, Journal of Financial Economics, Vol. 39, pp. 189-238.

Poitevin, M. (1989), *"Financial Signalling and the 'Deep-pocket' Argument"*, RAND Journal of Economics, Vol. 20, pp. 26-40.

Rosen, S. (1982), *"Authority, Control, and the Distribution of Earnings"*, Bell Journal of Economics, Vol. 13, pp. 311-323.

Sahlman, W. A. (1990), *"The Structure and Governance of Venture Capital Organizations"*, Journal of Financial Economics, Vol. 27, pp. 473-524.

Scherer, F. M. (1974), *"Secrecy, the Rule of Reason, and European Merger Control Policy"*, Antitrust Bulletin, Vol. 19, pp. 181-197.

Showalter, D. M. (1988), *"Oligopoly and Financial Structure: Comment"*, American Economic Review, Vol. 85, pp. 647-653.

Sleuwaegen, L. and Dehandschutter, W. (1991), *"Entry and Exit in Belgian Manufacturing"*, in P. A. Geroski and J. Schwalbach (eds.), *"Entry and Market Contestability: An International Comparison"*, Blackwell, Oxford and Cambridge.

Slovin, M. B., Sushka, M. E. and Hudson, C. D. (1991), *"Deregulation, Contestability, and Airline Acquisitions"*, Journal of Financial Economics, Vol. 30, pp. 231-251.

Stigler, G. J. (1968), *"The Organization of Industry"*, Richard D. Irwin Inc., Homewood Ill.

Sundaram, A. K., John, T. A. and John, K. (1996), *"An Empirical Analysis of Strategic Competition and Firm Values. The Case of R&D Competition"*, Journal of Financial Economics, Vol. 40, pp. 459-486.

Telser, L. G. (1966), *"Cutthroat Competition and the Long Purse"*, Journal of Law and Economics, Vol. 9, pp. 259-277.

Tirole, J. (1988), *"The Theory of Industrial Organization"*, MIT Press, Cambridge, MA.

Troske, K. (1989), *"The Life-Cycle Behavior of Establishments"*, mimeo, University of Chicago.

Van de Gucht, L. M. (1994), *"Leveraged Buyouts: An Empirical Examination of the Decision to Return to Public Status"*, Ph.D. Dissertation, University of South Carolina.

Van Hulle, C. (1998), *"Bedrijfsfinanciering in België: waar naartoe?"*, Tijdschrift voor Economie en Management, Vol. 43, pp. 71-103.

Wagner, J. (1994), *"The Post-Entry Performance of New Small Firms in German Manufacturing Industries"*, Journal of Industrial Economics, Vol. 42, pp. 141-154.

Williamson, O. E. (1977), *"Predatory Pricing: A Strategic and Welfare Analysis"*, Yale Law Journal, Vol. 87, pp. 284-340.

Wruck, K. H. (1990), "Financial Distress, Reorganization, and Organizational Efficiency", Journal of Financial Economics, Vol. 27, pp. 419-444.

Zmijewski, M. (1984), "Methodological Issues Relation to the Estimation of Financial Distress Prediction Model", *Journal of Accounting Research, Vol. 22, p. 59-82.*